

# SPECIFICATION

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## UNIVERSAL CAMERA MOUNTING ADAPTER AND METHOD

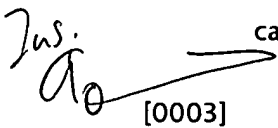
### Cross Reference to Related Applications

The present application claims the benefit of priority to Provisional Application 60/269,391, filed herein on February 16, 2001.

### Background of Invention

[0001] The present invention relates to an adapter for mounting a camera or the like on a telescope for afocal photography; more specifically, to a universal camera mounting apparatus that provides for flexible adjustment of the camera on a pivoting and sliding mounting mechanism, which may be fixed in a given position for long exposures required from telescopic photography.

[0002] A number of mounting devices for photographic equipment can be found in the prior art. Many of these prior art devices involved attaching fixed tubes screwably attached to the lens system or eyepiece of the telescope and providing a camera mount on the distal end of the tube for attachment of the camera. Other devices provided brackets which were mounted on the telescope which provided extensible arms for mounting a camera or videocamera to the bracket. These bracket were not readily aligned along the optical axis of the telescope and did not permit easy adjustment of the camera once attached to the bracket. None of the prior art devices offer the degrees of freedom to the mounting and adjustment offered by the universal camera mounting adapter of the present invention.

 [0003] A camera, which may be either single lens reflex or video camera, or charge coupled device (CCD) camera, may be affixed in front of the eyepiece of a telescope

such as a Schmidt-Cassegrain telescope (SCT) using the apparatus herein described. A rear cell adapter is threaded onto the telescope. Into this rear cell adapter, the regular viewing lens for the telescope is removably attached. Affixed to the rear cell adapter is yoke assembly that provides means for securing the yoke against the rear cell adapter. The yoke also provides a profile parallel to the axis of the the telescope. Into this profile a generally square rail formed from aluminum is attached and held in the profile with set screws. Attached to this rail is the camera base platform assembly that provides a similar profile to fit the generally square rail on the distal end of the rail. The camera base assembly is likewise provided with set screws which permit it to be moved from the distal end of the rail to any point along the square rail.

[0004] An attaching plate is affixed to the base of the camera and mates with the top of the camera base platform assembly. The attaching plate is grooved along one side to allow the camera to be moved laterally once attached to the platform. When the lens of the camera is aligned with the eyepiece on the telescope, another set screw may be engaged to hold the camera in a fixed position for the commencement of the photographic session.

[0005] Once the camera is attached and aligned with the eyepiece on the telescope, the lens of the camera and the lens on the telescope are covered with a plasticized hood with provides resilient members along its edge to fit snugly over the two lens to prevent ambient light from reaching the camera lens other than light which comes through the telescope lens.

## Brief Description of Drawings

[0006] Fig. 1 is a perspective disassembled drawing of the universal camera adapter assembly shown providing a mount to a telescope.

[0007] Fig. 2 is closer left posterior exploded view of the attachment plate and universal camera mounting platform.

[0008] Fig. 2a is a closer right posterior exploded view of the apparatus without camera attached.

[0009] Fig. 3 is a right side plan view of the platform assembly without mounted camera.

- [0010] Fig. 4 is a cross-sectional view of the platform assembly through the line 4-4 of Fig. 3.
- [0011] Fig. 5 is a posterior plan view of the platform assembly without mounted camera.
- [0012] Fig. 6 is a cross section view of the platform assembly through the line 6-6 of Fig. 5.
- [0013] Fig. 7 is a rear posterior view of the assembled universal camera mounting adapter with camera and SCT.
- [0014] Fig. 8 is a left side plan view of the assembled universal camera mounting adapter with camera (SLR), hood, and SCT.
- [0015] Fig. 9 is a right side plan view of the assembled universal camera mounting adapter with camera (SLR), hood, and SCT.
- [0016] Fig. 10 is a left side plan view of the assembled universal camera mounting adapter with videocamera and SCT, but without the hood.

## Detailed Description

- [0017] As previously noted, the applicant is unaware of any camera mounting device which permits afocal photography without significant adjustment and preparation of the mounting system. All other devices known to applicant are specific to a particular camera or mounting device and cannot be used for more than one type or style of camera. Directing our attention to Fig. 1, any single lens reflex camera, videocamera, or CCD, including digital cameras, may be connected to the universal camera platform 200. The universal camera platform is slideably engaged to a rail 100 which is slideably engaged in a yoke 30 which depends from a rear cell adapter 20 which is threaded on the rear plate of the telescope, for example as shown a Schmidt Cassegrain telescope SCT. It should be readily understood that the present apparatus might be also attached to other types of telescopes that permit the threaded attachment of the rear cell adapter 20. A single lens reflex camera, such a 35mm Nikon F camera, may be used, but it may be readily appreciated that any model of camera, videocamera, or CCD device could be mounted on the platform 200 by attaching the device to the camera plate adapter 260. The camera plate adapter 260

is mounted on the camera in a universally available screw mounting provided on all cameras and the adapter is aligned to be flush with the lower front edge of the camera to align the groove or slot 267 which is cut in the front face of the adapter plate 260 with the focal plane of the camera or other device. This assures that the camera will align with the eyepiece of the telescope when moved into axial alignment.

[0018] The camera, shown both as element 31 in the Fig. 7 and *SLR* in Fig. 8, and the videocamera *VC* as shown in Fig. 10, for example, may be provided with a readily available camera lens such as a 28 mm lens normally sold with such cameras. No special lenses are required to use the present device that adapts to the optical system inherent in the telescope lens and the camera lens.

[0019] The relationship between the rear cell adapter 20 which is screwed into the end of the telescope and provides interior throat to receive a standard telescope eyepiece 29, such as (by way of example, only) a 55 mm Plossl eyepiece offered by Televue, a retailer of lens systems for telescopes. The yoke 30 is fitted around the rear cell adapter and secured to the adapter by manual set screws 60. A generally square rail 100 is inserted in the longitudinal groove 85 formed on the outer edge of the yoke assembly 30. The generally square profile of the groove mates with the square rail 100 to form a snug fit which inhibits twisting motion of the rail/platform system in use. The square rail 100 is fixed in the groove by manually set compression screw 90 that compressively engages in the profile 85 and holds the rail to prevent movement in the yoke assembly 30. As may be further appreciated from Fig. 1, rail 100 is provided with a groove or slot 87 at its distal end to permit access to the ball set screw mechanism of the platform to adjust the angle or tilt of the platform after mounting the camera or other device. The rail 100 is also provided with set screws and holes at 80 and 80" which may be inserted to prevent the rail from being accidentally moved out of the grooves 85 or 86 and thereby prevents the accidental removal of the camera platform 200 from the rail 100 during the period of set up and adjustment. Set screw 80 may be used to lock the rail into the yoke at hole adjacent the SCT yoke plate or to lock the rail into the camera platform at hole 80" to prevent the movement of the camera platform back off of the rail while the operator's attention may be focused on viewing through the lens to set up the camera. Rail 100 is sufficiently strong to prevent any torque or twisting of the camera base in

operation.

[0020] The operation of the apparatus of the present invention may best be understood by viewing the cooperation of the parts of the platform 200 as more fully shown in a disassembled form in Fig. 2. Fig. 2 is a left posterior exploded view of the platform 200. Camera adapter plate 260 is attached to the camera or other device with threaded bolt 265 and then inserted from the opposite face into a groove 267. This adapter plate permits movement within the groove 267, which engages lip or T-edge 261, to permit axial alignment of the camera with the longitudinal axis of the SCT. This slideable engagement permits the user to align the camera shutter with the eyepiece of the telescope along what may be described as the x-axis as shown in Fig. 1. Once aligned the camera platform, with the adapter plate attached, may be locked by set screw 291 in any of the threaded holes on the back face 290 of the carrier.

[0021] The camera 31 (as shown in Fig. 14, for example) or the videocamera VC shown in Fig. 17, and adapter plate 260 are then engaged in the platform 200 which is in turn attached to the rail 100 supported by the yoke 30 and rear cell adapter 20 which are mounted around the lens 29 on the telescope. The yoke 30 is held to the rear cell adapter 20 by manually engaged set screws 60 and the rail is held fast by manually engaged set screws 90. Upon alignment of the camera lens with the telescope lens 29, as noted in Fig. 2, set screw 270 is tightened to hold the platform 200 set on rail 100. The movement of the camera platform 200 on the rail 100 may be described as movement along the y-axis in the context of Fig. 1.

[0022] Knob 250, which connects to platform carrier 320 by the engagement of screw 254, may be used to selectively move the camera in a plane perpendicular to the longitudinal axis (or optical axis) of the telescope, which therefore may best be described as the z-axis of this system as described in Fig. 1. As may be readily appreciated, the camera may be adjusted forwards and backwards along the rail 100, and may be adjusted side to side along the slot or groove on the adapter plate 260, and moreover, the plane of the camera may be adjusted by the movement of the adapter plate in the platform with knob 250.

[0023] Further, as shown in Fig. 2, once the camera lens is axially aligned with the telescope eyepiece stop screw 281 may then be moved into engagement with camera

adapter 260 to fix the point of alignment. A set screw in bore 282 is then set to engage the stop screw and maintain it at the appropriate setting for the camera to permit removal without disturbing the settings. Set screws 297 are engaged in set screw holes 290 to rigidly hold the camera adapter 260 against the T-edge 261". Set screws are disengaged to permit the camera to be removed from the platform 200 without changing any of the settings for alignment purposes. It is expected that once all of the adjustments are made for a particular camera and lens combination, little or no time will be required by the operator to assemble and disassemble the camera and telescope together.

[0024] Tiltable platform 290, which supports the camera platform 260, may be pivoted about the axis formed by shoulder bolts 327 which engage the tiltable platform and connect it to the base platform 320. As more readily shown in Fig. 2a (which is another posterior view as seen from the opposite side of Fig. 2), a ball-headed screw 325, which slideably engages in the semi-circular profile 325" on the lower side of tiltable platform 290, may be screwed up and down in base platform 320 from below with an Allen wrench which fits the cap head screw below the ball. Referring back to Fig. 1, rail 100 provides a slit or groove 87 through which an Allen wrench may be inserted to screwably adjust the ball-headed screw 325 through hole 325" in the base plate 201 and hole 325" in platform 300.

[0025] Fig. 3 is a left side plan view of the camera platform showing the threads 265 of the bolt which engage the camera (not shown in this view). Fig. 3 further shows the spaced relationship of the end plate 280 affixed to platform 320 by screws 283. It further shows the set screw 287 which fixes the lateral movement of the camera carrier 260 which is then fixed by set screw 297. Once the proper perpendicular movement brings the camera lens into axial alignment with the telescope eyepiece 29 through the movement of knob 250, set screws 322 may be moved into engagement of platform 320 to fix the perpendicular movement of the system.

[0026] Fig. 4 is a posterior cross sectional view of the platform 200 through the line 4-4 of Fig. 3. Camera carrier 260 and mounting screw 265 slideably engage T-edge or rail 261" and are titlably supported on carrier 290. Knob 270 moves a compressive screw into space or groove 86 to fix the platform 200 in spaced relationship with the

optical axis of the telescope and camera. As previously noted, knob 250 moves platform or base 320 in a plane perpendicular with the said optical axis of the telescope and camera to align their respective optical center lines. Carrier or platform 320 is allowed to smoothly move in the body 200 by bearings 252 and 253 and screws 254 in the platform.

[0027] Fig. 5 is a posterior plan view of the camera adapter platform 200 showing the spaced relationship of many of the parts previously discussed as well as the slots 311 through which socket head shoulder screws 310 attach to the platform 320 to provide a limited range of movement in part 300. This limited range of travel is necessary to prevent part 320 from detaching from the engagement screw 254 that in turn screw 254 is attached to knob 250. Set screw 322, upon engagement, clamps platform 320 fixing the said platform in the Z-axis context of Fig. 1. Fig. 5 also again shows the knobs 270 and 250 that are used to lock the platform 200 on the rail and move the interior platform 320, respectively.

[0028] Fig. 6 is a cross sectional view of the platform 200 through the line 6-6 of Fig. 5 which further discloses the spaced relation of the parts of the platform. Each of the parts is consistently numbered throughout the drawings. This figure more clearly demonstrates the relationship between the adjustment passages 325" and 325'" which permit the manipulation of the ball headed screw 325 to tilt platform 290 to achieve a high degree of linear alignment of the camera lens with the optical axis of the telescope system to which it is attached. As previously noted, the rail 100 after insertion in slot 86 as shown in Fig. 1 is provided with slot 81 which allows an Allen wrench to be inserted into the body while the camera is in place to adjust the tilt of the camera platform.

[0029] Fig. 7 is a right posterior perspective view of the complete assembly showing the platform 200 mounting a single lens reflex camera 31 on rail 100 in spaced relationship with telescope lens 29 mounted on a Schmidt-Cassegrain telescope SCT. As may be readily appreciated, there may be a substantial gap between the lens 29 of the SCT and the lens of the camera 31. Accordingly, a further feature of this invention is the addition of a lens hood.

[0030] Fig. 8 shows hood 2 fabricated from a water resistant fabric incorporating a

flexible wire frame on at least two edges to hold the fabric around the two lens system. The fabric may be made from any lightweight and opaque material. The hood could also be fabricated from lightweight elastomeric material. The hood 2 may be further connected or attached to the rail 100 by the flexible wire frame; or, alternatively, may be attached after alignment without attachment to the rail. Fig. 9 shows the hood 2 attached to rail 100 from the opposite side of the hood system shown in Fig. 8. Any method of attachment may be used such as the wrapping of the metal wire around the frame 100 such as shown in 2", or by other well-known means of attachment.

[0031] As previously noted, Fig. 10 shows the flexibility of the mounting system of the present invention. A videocamera VC is mounted in the manner previously described for mounting the single lens reflex camera to the top of the platform 200 and on rail 100 affixed to yoke 30, and thereafter adjusted to put videocamera into axial alignment with the optical axis of the telescope. Similarly, a charge coupled device or digital videocamera could likewise be attached in the same manner to use the mounting system without departing from the spirit of the invention disclosed herein. Furthermore, larger optical devices could be mounted in a similar fashion using an larger adjustable platform adapted by the addition of an additional post to secure the larger instrument to the platform without departing from the scope or intent of the specification.

[0032] The foregoing embodiments are presented by way of example only; the scope of the present invention is to be limited only by the following claims.